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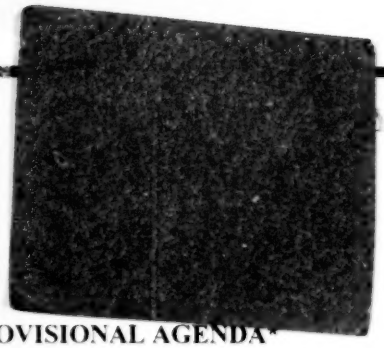
COMMITTEE ON THE PEACEFUL
USES OF OUTER SPACE
Scientific and Technical Subcommittee
Thirty-fifth session
Vienna, 9-20 February 1998



PROVISIONAL AGENDA*

1. Election of the Chairman.

2. Adoption of the agenda.

3. Statement by the Chairman.

4. General exchange of views.

5. United Nations Programme on Space Applications and the coordination of space activities within the United Nations system.

6. Preparations for the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) by the Advisory Committee for UNISPACE III.

7. Matters relating to remote sensing of the Earth by satellites including, *inter alia*, applications for developing countries.

8. Use of nuclear power sources in outer space.

9. Space debris.

10. Questions relating to space transportation systems and their implications for future activities in space.

*Items 5 to 9 should be given priority in accordance with paragraph 15 of General Assembly resolution 52/56.

11. Examination of the physical nature and technical attributes of the geostationary orbit and of its utilization and applications, including, *inter alia*, in the field of space communications, as well as other questions relating to space communications developments, taking particular account of the needs and interests of developing countries.

12. Matters relating to life sciences, including space medicine.

13. Progress in national and international space activities related to the Earth environment, in particular progress in the International Geosphere-Biosphere (Global Change) Programme.

14. Matters relating to planetary exploration.

15. Matters relating to astronomy.

16. The theme fixed for special attention at the thirty-fifth session of the Scientific and Technical Subcommittee: "Scientific and technical aspects and applications of space-based meteorology".

17. Other matters:

    (a) Implementation of the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space;

    (b) Schedule of work for the Scientific and Technical Subcommittee at its thirty-sixth session, in 1999;

    (c) Other reports.

18. Report to the Committee on the Peaceful Uses of Outer Space.

ANNOTATIONS

Items 1. Election of the Chairman

1. At its fortieth session, the Committee on the Peaceful Uses of Outer Space adopted new measures concerning the composition of the bureaux of the Committee and its subsidiary bodies, agenda structures and duration of sessions, which are contained in annex I of its report on that session.[1] The Committee agreed that, for the first three-year term, starting in 1998, the Chairman of the Scientific and Technical Subcommittee should be Dietrich Rex (Germany).[2] The Subcommittee should formally elect him as Chairman for the above term.

Items 2, 3 and 4. Adoption of the agenda

Statement by the Chairman

General exchange of views

2. Following the adoption of the agenda by the Subcommittee, the Chairman will make a statement reviewing developments of relevance to the work of the Subcommittee that have taken place since its thirty-fourth session. After the Chairman's statement, the Subcommittee will organize a schedule of work (the indicative schedule of work, which will be followed with flexibility, is contained in the annex to the present provisional agenda).

3. The general exchange of views will start during the meeting to be held on the morning of 9 February 1998.

Item 5. United Nations Programme on Space Applications and the coordination of space activities within the United Nations system

4. The General Assembly, in paragraph 15 of its resolution 52/56, endorsed the recommendation of the Committee that the Subcommittee should continue the consideration of this item on a priority basis.

(a) Report of the Expert on Space Applications

5. The views of the Subcommittee regarding the United Nations Programme on Space Applications for the period 1996-1998 are set out in the report on the work of its thirty-fourth session (A/AC.105/672, paras. 23-34). The views of the Committee on the part of the report of the Subcommittee concerning this item are reflected in paragraphs 35 to 59 of the report of the Committee on its fortieth session.[1] The General Assembly, in paragraph 19 of its resolution 52/56, endorsed the Programme for 1998 as proposed to the Committee by the Expert on Space Applications (A/AC.105/660, sect. I).

6. The Subcommittee will have before it the report of the Expert covering the implementation of the Programme during 1997 and 1998, as well as the activities proposed for 1999 (A/AC.105/693). The report will also cover arrangements made by the Secretariat with other organs, bodies and organizations of the United Nations system to use available resources and secure additional financial support for the Programme, as recommended by the Working Group of the Whole to Evaluate the Implementation of the Recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space at its sixth session (A/AC.105/513, annex II, para. 19 (c)). The report of the Expert will also provide the Subcommittee with an update on the regional centres for space science and technology education and on the regional meetings to be held in preparation for UNISPACE III (see also the annotations for item 6 below).

7. In addition, the Subcommittee will have before it the following reports on training courses, conferences and workshops held in 1997: report of the Seventh United Nations/Sweden International Training Course on Remote Sensing Education for Educators, held at Stockholm and Kiruna, Sweden, from 5 May to 13 June 1997 (A/AC.105/678); report of the Seventh United Nations/European Space Agency Workshop on Basic Space Science, held at Tegucigalpa from 16 to 20 June 1997 (A/AC.105/682); report of the United Nations/Austria/European Space Agency Symposium on Space Industry Cooperation with the Developing World, held at Graz, Austria, from 8 to 11 September 1997 (A/AC.105/683); report of the United Nations/Israel Workshop on Space Communications Technology for Capacity Building, held at Haifa, Israel, from 21 to 25 September 1997 (A/AC.105/684); report of the United Nations/International Astronautical Federation Workshop on Space Technology as a Cost-effective Tool to Improve Infrastructure in Developing Countries, held at Turin, Italy, from 2 to 5 October 1997 (A/AC.105/686); report of the United Nations/European Space Agency/Committee on Space Research/Brazil Workshop on Data Analysis Techniques, held at São José dos Campos, Brazil, from 10 to 14 November 1997 (A/AC.105/687); report of the fourth United Nations/European Space Agency Training Course on Applications of the European Remote Sensing Satellite Data for Natural Resources, Renewable Energy and the Environment, organized for English-speaking African Countries, held at Frascati, Italy, from 24 November to 5 December 1997 (A/AC.105/688); and *Seminars of the United Nations Programme on Space Applications: Selected Papers on Space Technology and Industry, Space Science and Education*, 1998 (A/AC.105/690).

(b) Report of the Secretary-General on coordination of space activities within the United Nations system

8. The nineteenth Inter-Agency Meeting on Outer Space Activities will be held at Vienna from 2 to 3 June 1998. The report of that Meeting, as well as the report on coordination to be contained in the document

entitled "Coordination of outer space activities within the United Nations system: programmes of work for 1998 and 1999 and future years", will be issued in due course.

Item 6. Preparations for the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) by the Advisory Committee for UNISPACE III

9. The General Assembly, in paragraph 15 of its resolution 52/56, endorsed the recommendation of the Committee that the Subcommittee should consider this item on a priority basis.

10. The General Assembly, in paragraph 23 of its resolution 52/56, agreed that the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) should be convened at the United Nations Office at Vienna from 19 to 30 July 1999 as a special session of the Committee on the Peaceful Uses of Outer Space, open to all States Members of the United Nations. In paragraph 24 of the same resolution, the Assembly endorsed the recommendations made by the Preparatory Committee at its 1997 session, as contained in the report of the Committee on the Peaceful Uses of Outer Space on its fortieth session,[3] and requested the Advisory Committee to carry out its tasks in accordance with those recommendations.

11. The General Assembly, in paragraph 17 of its resolution 52/56, agreed that the Subcommittee should reconvene, at its thirty-fifth session, the Working Group of the Whole to assist the Advisory Committee in its preparatory work for UNISPACE III.

12. The Subcommittee will have before it an initial draft of the report for UNISPACE III (A/AC.105/689) and an indicative programme of work to be conducted prior to and during UNISPACE III (A/AC.105/685), prepared by the executive secretariat in response to requests by the Preparatory Committee.[4]

Item 7. Matters relating to remote sensing of the Earth by satellites including, *inter alia*, applications for developing countries

13. The General Assembly, in paragraph 15 of its resolution 52/56, endorsed the recommendation of the Committee on the Peaceful Uses of Outer Space that the Subcommittee should continue the consideration of this item on a priority basis.

Item 8. Use of nuclear power sources in outer space

14. The General Assembly, in paragraph 15 of its resolution 52/56, endorsed the recommendation of the Committee that the Subcommittee should continue the consideration of this item on a priority basis.

15. In response to the invitation contained in paragraph 18 of the same resolution, the Subcommittee will have before it contributions from Member States regarding national and international research concerning the safety of space objects with nuclear power sources on board.

16. At its thirty-fourth session, the Subcommittee reconvened the Working Group on the Use of Nuclear Power Sources in Outer Space. The Subcommittee adopted the report of the Working Group at its fourteenth session (A/AC.105/672, annex III), which included a recommendation that the Working Group should be reconvened during the thirty-fifth session of the Subcommittee.

Item 9. Space debris

17. The General Assembly, in paragraph 15 of its resolution 52/56, endorsed the recommendation of the Committee that the Subcommittee should continue the consideration of this item on a priority basis.

18. The General Assembly, in paragraph 29 of the same resolution, considered that it was essential that Member States pay more attention to the problem of collisions of space objects (including those with nuclear power sources) with space debris and to other aspects of space debris and called for, among other things, the continuation of national research on that question. The Subcommittee will have before it a document (A/AC.105/680) containing the contributions on that subject received by the Secretariat from Member States. Any additional contributions received by the Secretariat after the preparation of the present annotated provisional agenda will be brought to the attention of the Subcommittee.

19. The General Assembly, in paragraph 14 of the same resolution, agreed with the Committee that the multi-year work plan on space debris should continue to be implemented with flexibility. Attention is drawn to the text of the work plan (A/AC.105/605, para. 83), which indicates that, at its thirty-fifth session, the Subcommittee should concentrate on space debris mitigation measures, including a review of current operational debris mitigation practices and consideration of future mitigation methods with regard to cost-efficiency.

20. At its fortieth session, the Committee agreed with the Subcommittee that any changes or updates to each part of the technical report would be made at the following year's session, leading to the report on space debris being finalized by the Subcommittee in 1999.[5]

21. The Subcommittee will have before it a report prepared by the Secretariat on various steps taken by space agencies to reduce the growth or damage potential of space debris (A/AC.105/681).

Item 10. Questions relating to space transportation systems and their implications for future activities in space

22. The General Assembly, in paragraph 15 of its resolution 52/56, endorsed the recommendation of the Committee that the Subcommittee should continue the consideration of this item at its thirty-fifth session.

Item 11. Examination of the physical nature and technical attributes of the geostationary orbit and of its utilization and applications, including, *inter alia*, in the field of space communications, as well as other questions relating to space communications developments, taking particular account of the needs and interests of developing countries

23. The General Assembly, in paragraph 15 of its resolution 52/56, endorsed the recommendation of the Committee that the Subcommittee should continue the consideration of this item at its thirty-fifth session. The Subcommittee will have before it at its thirty-fifth session a working paper on the item (A/AC.105/C.1/L.216), submitted by the Czech Republic.

Item 12. Matters relating to life sciences, including space medicine

24. The General Assembly, in paragraph 15 of its resolution 52/56, endorsed the recommendation of the Committee that the Subcommittee should continue the consideration of this item at its thirty-fifth session.

Item 13. Progress in national and international space activities related to the Earth environment, in particular progress in the International Geosphere-Biosphere (Global Change) Programme

25. The General Assembly, in paragraph 15 of its resolution 52/56, endorsed the recommendation of the Committee that the Subcommittee should continue the consideration of this item at its thirty-fifth session.

Item 14. Matters relating to planetary exploration

26. The General Assembly, in paragraph 15 of its resolution 52/56, endorsed the recommendation of the Committee that the Subcommittee should continue the consideration of this item at its thirty-fifth session.

Item 15 Matters relating to astronomy

27. The General Assembly, in paragraph 15 of its resolution 52/56, endorsed the recommendation of the Committee that the Subcommittee should continue the consideration of this item at its thirty-fifth session.

Item 16. The theme fixed for special attention at the thirty-fifth session of the Scientific and Technical Subcommittee: "Scientific and technical aspects and applications of space-based meteorology"

28. The General Assembly, in paragraph 15 of its resolution 52/56, endorsed the recommendation of the Committee that the theme fixed for the special attention of the Subcommittee at its current session should be "Scientific and technical aspects and applications of space-based meteorology".

29. In accordance with the same resolution, the Committee on Space Research (COSPAR) and the International Astronautical Federation (IAF), in liaison with Member States, have been invited to arrange a symposium on this theme, with as wide a participation as possible, to be held during the first week of the session of the Subcommittee, at the end of its meetings, in order to complement its discussions (see note *a* in the annex to the present annotated provisional agenda). A detailed programme of the symposium will be issued in due course.

Item 17. Other matters

(a) Implementation of the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space

30. The General Assembly, in paragraph 17 of its resolution 52/56, agreed that the Scientific and Technical Subcommittee should reconvene, at its thirty-fifth session, the Working Group of the Whole to conclude its evaluation of the implementation of the recommendations of the Second Conference.

31. The views on the item of the Subcommittee at its thirty-fourth session are contained in paragraphs 18 to 57 of its report (A/AC.105/672). The views of the Committee at its fortieth session on the report of the Subcommittee on the item are contained in paragraphs 30 to 69 of the report of the Committee.[1] Attention is also drawn to the report of the Secretary-General on the implementation of the recommendations of the Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space (A/52/307).

32. The General Assembly, in paragraph 16 of its resolution 52/56, endorsed the recommendations of the Working Group of the Whole, as endorsed by the Committee and as contained in the report of the Working Group of the Whole (A/AC.105/672, annex II). In response to requests by the Working Group of the Whole, the Subcommittee will have before it a document (A/AC.105/679) containing information submitted by Member States on national and international space activities and a number of reports from international organizations. The document will also include information on space activities that were or could be the subject of greater international cooperation and on the resources and technological capabilities of States in space activities. The Subcommittee will have before it a technical study on developing tele-education programmes through international cooperation (A/AC.105/667).

(b) Schedule of work for the Scientific and Technical Subcommittee at its thirty-sixth session, in 1999

33. In accordance with paragraph 160 of its report on the work at its thirty-fourth session (A/AC.105/672), the Subcommittee at its thirty-fifth session should determine which items of its agenda should be considered at its session in 1999, in order to allow the Committee to confirm at its forty-first session, in June 1998, the exact schedule of the regular sessions of the Committee and its subsidiary bodies in 1999, the year during which UNISPACE III is to be convened.

(c) Other reports

34. The Subcommittee will also have before it a document entitled *Highlights in Space: Progress in Space Science, Technology and Applications, International Cooperation and Space Law, 1997* - reports submitted by COSPAR, IAF and the International Institute of Space Law and published as an integrated document (A/AC.105/691).

35. Additional reports may be submitted to the Subcommittee.

Notes

[1] *Official Records of the General Assembly, Fifty-second Session, Supplement No. 20* (A/52/20).

[2] Ibid., annex I, para. 4.

[3] Ibid., sect. II, paras. 145-161.

[4] Ibid., paras. 156-157.

[5] Ibid., para. 89.

Annex

INDICATIVE SCHEDULE OF WORK*

Date	*Morning*	*Afternoon*
Monday, 9 February	Item 1 - Election of the Chairman Item 2 - Adoption of the agenda Item 3 - Statement by the Chairman Item 4 - General exchange of views	Item 4 - General exchange of views Item 16 - Scientific and technical aspects and applications of space-based meteorology[a]
Tuesday, 10 February	Item 4 - General exchange of views Item 5 - United Nations Programme on Space Applications Item 6 - UNISPACE III[b]	Working Group of the Whole: Item 17 (a) - Implementation of the recommendations of the Second Conference[c] Item 16 - Scientific and technical aspects and applications of space-based meteorology
Wednesday, 11 February	Item 5 - United Nations Programme on Space Applications Working Group of the Whole: Item 6 - UNISPACE III	Item 5 - United Nations Programme on Space Applications Working Group of the Whole: Item 6 - UNISPACE III
Thursday, 12 February	Item 5 - United Nations Programme on Space Applications Working Group of the Whole: Item 6 - UNISPACE III	Item 10 - Space transportation systems Item 11 - Geostationary orbit
Friday, 13 February	Working Group of the Whole: Item 6 - UNISPACE III	Item 12 - Life sciences Item 14 - Planetary exploration
Monday, 16 February	Item 9 - Space debris	Item 9 - Space debris Item 8 - Nuclear power sources[d]

*The Committee on the Peaceful Uses of Outer Space, at its thirty-eighth session, agreed that Member States would continue to be provided with an indicative schedule of work, which would be without prejudice to the actual timing of consideration of specific agenda items, and that the work of the Committee and its subsidiary bodies should be considered with a view to concluding the sessions of those bodies as early as practicable, without prejudice to their giving full consideration to the items on their agendas (*Official Records of the General Assembly, Fiftieth Session, Supplement No. 20* (A/50/20), paras. 168 and 169 (b)).

Date	*Morning*	*Afternoon*
Tuesday, 17 February	Item 9 - Space debris	Working Group of the Whole: Item 6 - UNISPACE III
	Item 8 - Nuclear power sources	Item 13 - Earth environment
Wednesday, 18 February	Item 7 - Remote sensing	Item 6 - UNISPACE III (adoption of the report of the Working Group of the Whole by the Advisory Committee)
	Item 13 - Earth environment	Item 17 (a) - Implementation of the recommendations of the Second Conference (adoption of the report of the Working Group of the Whole)
Thursday, 19 February	Item 15 - Astronomy	Item 17 - Other matters
	Item 17 - Other matters	Item 18 - Report to the Committee
Friday, 20 February	Item 18 - Report to the Committee	Item 18 - Report to the Committee

[a] In accordance with General Assembly resolution 52/56, paragraph 15, a symposium on the theme for special attention at the thirty-fifth session of the Scientific and Technical Subcommittee, "Scientific and technical aspects and applications of space-based meteorology", organized by the Committee on Space Research and the International Aeronautical Federation, will be held on 9 and 10 February 1998, following the early adjournment of the afternoon meeting of the Subcommittee on each of those days.

[b] In accordance with General Assembly resolution 51/123, paragraph 29, the Subcommittee will act as the Advisory Committee for the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III). In accordance with General Assembly resolution 52/56, paragraph 17, the Working Group of the Whole will be reconvened, starting on Wednesday, 11 February, to assist the Advisory Committee in carrying out its task as requested by the Assembly in paragraph 24 of that resolution. The Subcommittee acting as the Advisory Committee will take up item 6 again on Wednesday, 18 February, with a view to adopting the section of the report of the Working Group of the Whole concerning that item.

[c] In accordance with General Assembly resolution 52/56, paragraph 17, the Working Group of the Whole will be reconvened to conclude its evaluation of the implementation of the recommendations of the Second Conference. The Subcommittee will take up item 17 (a) on Wednesday, 18 February, with a view to adopting the section of the report of the Working Group of the Whole concerning that item.

[d] The Working Group on the Use of Nuclear Power Sources in Outer Space, to be reconvened in accordance with the report of the Working Group on its fourteenth session (A/AC.105/672, annex III, para. 5), will meet during the time allocated for item 8. Pursuant to the recommendation made by the Subcommittee at its thirty-fourth session (A/AC.105/672, para. 87), the time allocated to the item in the Subcommittee and in the Working Group should be adjusted as appropriate. States are invited to include appropriate technical experts in their delegations to ensure an informed discussion on the safety issues raised in the Working Group at its fourteenth session, in 1997.

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COMMITTEE ON THE PEACEFUL
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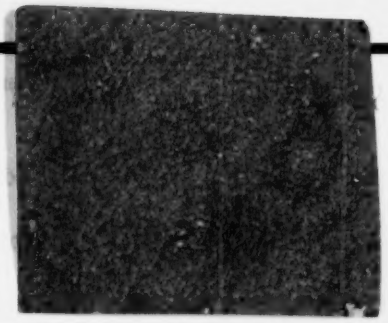
Scientific and Technical Subcommittee
Thirty-fifth session
Vienna, 9-20 February 1998
Agenda item 11



EXAMINATION OF THE PHYSICAL NATURE AND TECHNICAL ATTRIBUTES OF THE GEOSTATIONARY ORBIT; EXAMINATION OF ITS UTILIZATION AND APPLICATIONS, INCLUDING, INTER ALIA, IN THE FIELD OF SPACE COMMUNICATIONS, AS WELL AS OTHER QUESTIONS RELATING TO SPACE COMMUNICATIONS DEVELOPMENTS, TAKING PARTICULAR ACCOUNT OF THE NEEDS AND INTERESTS OF DEVELOPING COUNTRIES

Working paper submitted by the Czech Republic

Introduction

The discussions conducted during the fortieth session of the Committee on the Peaceful Uses of Outer Space have shown that further progress in the item on the geostationary orbit might be assisted by a common understanding of the physical nature and technical attributes of the geostationary orbit.

The geostationary satellite orbit is a complicated phenomenon of the dynamical system of the Earth. It involves natural forces acting on the geostationary satellite, as well as man-made impulses counteracting natural perturbative forces which remove the geostationary satellite from its nominal position.

Discussions of the equitable access to, and use of, the orbit can reach universally acceptable solutions only if they are, explicitly or implicitly, based on established scientific and technical facts and if they respect existing physical constraints.

The present paper is an attempt to find brief consensus statements on important features of the geostationary orbit with a view to facilitating discussions in the Committee and its subcommittees.

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The dynamical system of the Earth

The gravitational attraction generated by the entire body of the Earth is the main natural force acting on artificial Earth satellites. It acts on all satellites in the vicinity of the Earth without exception, up to a distance that exceeds the distance of the Moon.

Consequently:

The existence of orbits of all satellites, including the geostationary satellites, depends mainly on gravitational phenomenc generated by the entire body of the Earth.

In addition, minor gravitational forces affect and significantly modify orbits of artificial satellites. Of importance, for geostationary satellites, are:

- The gravitational attraction of the Sun and the Moon, called lunisolar perturbations,
- Perturbations caused by the oblateness of the Earth,
- Perturbations caused by the ellipticity of the Earth's equator.

In addition, minor non-gravitational forces affect and modify orbits of artificial satellites. Of importance for geostationary satellites is:

- The radiation pressure of the Sun, which generates relatively small deviations of the geostationary satellite from its orbit under gravitational forces.

The geostationary orbit

According to the Radio Regulations of the International Telecommunication Union, the geostationary obit is the orbit on which a satellite should be placed to be a geostationary satellite. Its circular orbit lies in the plane of the Earth's equator. The satellite turns about the polar axis of the Earth in the same direction and with the same period as those of the Earth's rotation.

The geostationary orbit is situated at a distance of 42,165 kilometres from the centre of the Earth. The satellite can be observed from, and provide telecommunication services to, all points on the surface of the Earth if it is at least 5 degrees to 10 degrees above the horizon.

If the geostationary satellite is left to natural forces, it will not stay fixed in the geostationary orbit. Lunisolar perturbations, together with perturbations caused by the oblateness of the Earth, will remove it gradually from the equatorial plane, initially at a rate of 0.85 degrees per year. If viewed from the ground, the satellite will not appear stationary, but will describe in the sky a figure "eight". That figure will have an amplitude of about 3.4 kilometres the first day, over 100 kilometres in a month and 1,250 kilometres after one year.

The perturbations caused by the ellipticity of the Earth's equator move the satellite in longitude around one of the stable points at approximately 105 degrees east and 75 degrees west. Small movements in longitude are caused also by the radiation pressure of the Sun.

If the satellite has to be kept close to its nominal position, all its perturbative motions have to be corrected by occasional man-made impulses called "station-keeping".

Consequently:

A geostationary satellite, if acted upon either by natural forces or by man-made impulses, is not fixed over a point on the Earth's equator. Between corrective impulses of its station-keeping, it is in a natural flight caused by gravitational as well as non-gravitational forces generated by the Earth, the Sun and the Moon.

Conclusion

The discussions on the geostationary orbit will be significantly facilitated if the Scientific and Technical Subcommittee reaches consensus on the two statements in italics above and if those statements are considered as the agreed opinion of the Subcommittee.